Philadelphia Water Department Conservation Assistance Program Profile #109

2	Executive Summary
3	Utility Overview Philadelphia Water Department 1994 Statistics
5	Program Design and Delivery Marketing and Delivery; Measures Installed; Staffing Requirements
8	Monitoring and Evaluation Monitoring; The Impact Evaluation; The Process Evaluation
10	Program Savings Customer Bill Savings; Participation Table; Participation Rates; Measure Lifetime; Savings Overview; Annual Water Savings; Cumulative Water Savings
12	Cost of the Program Costs Overview; Program Cost Components; Cost Per Participant; Cost Effectiveness; Measures Overview 1993
14	Lessons Learned / Transferability
17	References

Executive Summary

The Philadelphia Water Department (PWD) has managed the Conservation Assistance Program (CAP) since 1986. CAP is a direct-installation effort designed to assist low-income and "payment-troubled" customers better manage their water consumption through education and water efficiency measures and repairs, and in particular to help lower future water usage and cost. The program has resulted in an impressive average household water savings of 25%.

The Water Department has contracted the administration of the CAP program to the Energy Coordinating Agency of Philadelphia, Inc. (ECA), an organization that provides a range of social services in the City. The program is delivered by Neighborhood Energy Centers (NEC) located throughout the City and subcontracted by the ECA. The NECs are considered essential to the success and endurance of the program. These independent, education-oriented, community-based centers provide a range of services including job training, day care, and after-school programs, as well as various government fuel assistance efforts. The Centers are well-known in the areas they serve, therefore the marketing of the program is minimal, consisting mainly of NEC counselors informing customers of it, announcements in the NECs' newsletters, workshops, and occasional bill stuffers by the Water Department.

As a revenue-generating department with an abundant supply of water, the Philadelphia Water Department is not looking to save peak demand or sell less water through the CAP program. Instead, the emphasis of the program is on education about water use, minor plumbing repairs, and efficient devices so that customers can reduce and pay their water bills. This said, the program has saved water. The annual water savings per participant is almost 4,000 ft³ at a cost per treated house of \$186 including measures installed, labor, marketing, and administration. CAP not only repairs minor leaks and installs water-efficient devices such as low-flow showerheads and faucet aerators, but also takes the time to explain how the products work, how to maintain them, how to perform minor repairs, and how a customer may change his or her habits concerning water usage.

CAP has been successful in fulfilling several objectives including water savings, payment behavior, and cost-effectiveness. The reductions in water usage in treated homes average 25% with most of the savings coming from the highest usage customers. Bill arrearage decreased an average of \$33, and for every dollar invested in CAP the Water Department receives \$1.48 in benefits through reduced future arrears over a tenyear period. With a substantial rate increase in the last two years, the program has become an even more important tool in aiding Philadelphia's low-income water customers.

PHILADELPHIA WATER DEPARTMENT Conservation Assistance Program

Sector: Low-income customers in arrears

History: CAP began in 1986 for low-income,

"payment troubled" customers; average home savings of 4,000 cubic feet, equivalent to 25% of

pre-retrofit consumption

Mechanism: City pays up to \$250 per treated

home; administered by the Energy Coordinating Agency and delivered by several Neighborhood Energy Centers (NECs) which concurrently implement other City programs; NECs staffed by local citizens who not only detect and fix major leaks but who also install efficiency measures while educating customers about water efficiency

and reducing water bills

Measures: High-performance showerheads and

faucet aerators; toilet retrofit devices;

toilet, pipe and faucet repairs

1992-93 CUMULATIVE PROGRAM DATA

Water savings: 15,786 MCF Lifecycle water savings: 106,418 MCF

Litecycle water savings: 106,418 MCF Participants: 3,981

Cost: \$497,700

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. ANNUALSAVINGS refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. CUMULATIVE SAVINGS represent the savings in a given year for all measures installed to date. LIFECYCLE SAVINGS are calculated by multiplying the annual savings by the assumed average measure lifetime. CAUTION: cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

The City of Philadelphia Water Department (PWD) is one of the oldest municipally owned and operated water systems in the United States. It draws water from both the Delaware and Schuylkill Rivers and returns treated wastewater to them. Formed in January 1801, two steam-powered, water pumping stations were opened representing one of the first large-scale applications of steam energy to water service in this country. The system was designed by Henry Latrobe, an architect who went on to design the Capitol in Washington, D.C..

In 1815 the pumping stations were replaced by a gravity water works which was cheaper to operate and less prone to break downs. In this configuration the two steam engines were used to lift water to a reservoir on a hill above the City from which the water was then gravity fed to residences below. In 1818 one of the steam engines blew up and Philadelphia turned to the use of water-wheels to lift the water. The new water-driven works went into operation on July 1, 1822, the first of its type built for public water service in any large American city. By 1842 there were eight paddle wheels supplying water to four hilltop reservoirs. In 1851, the first water turbine was installed at the station and by 1871 all the paddle wheels had been superseded by them. In 1911 the last of the turbines were replaced by modern filtration plants. [R#5]

The Philadelphia Water Department certainly has a colorful history. The piping through which the water reached Philadelphia houses was originally made of hollowed out logs connected by iron bands and caulking. These logs leaked constantly and by 1832, with 241,604 feet laid, the City stopped installing them. Cast iron piping gradually replaced the logs and by 1852 the wooden mains were no longer used (though many of them were left in the ground) and 440,403 feet of cast iron mains were in service. Today the water system boasts 3,200 miles of cast iron mains including a few that date back to the 1830s and 1840s still in use. [R#5]

Until the turn of the century the predominant procedure for purifying water was by allowing suspended particles to settle to the bottom by providing quiet periods at the reservoirs. By the mid-1800s the Delaware and Schuylkill Rivers were becoming polluted. Tastes and odors were appearing in the water and ty-

PHILADELPHIA WATER DEPARTMENT 1994 STATISTICS						
Number of Customers	486,358					
Number of Employees	2,300					
Water Sales	74,000	million/gal/year				
Water Sales Revenue	\$111	million/year				
Average Output	349	million/gal/day				
Peak Demand	377	million/gal/day				
Output Capacity	540	million//gal/day				
Reserve Margin	43%					
Average Water Rates						
Residential	\$12.42	/month				
Commercial	\$485.07	/month				
Industrial	\$12,504.14	/month				

phoid fever was on the increase in the City. Seven special studies were conducted on water sources and treatment in the latter half of the century and the result in Philadelphia was that five new filtration plants entered service between 1902 and 1911. These "slow-sand" plants were state-of-the-art and the biggest in the world. Most importantly, they caused the number of typhoid deaths in the City to drop by three-quarters. With the introduction of chlorine water treatment in 1913, typhoid was expunged. [R#5]

From the early 1900s on, the water works languished due to a lack of public funds. Then in 1952 the self-supporting Philadelphia Water Department was born and with it the ability to generate much-needed capital. This launched a \$217 million construction program which ran from 1952-1976. To meet the growing City's needs the Department built three modern "rapid-sand filter" treatment plants with semi-automatic controls (the Baxter, Belmont, and Queen Lane stations), 16 unmanned pumping stations which are operated from one control center, hundreds of miles of new mains, and covered reservoirs to protect water from taste and odor-causing algae. Today about one-third of the water system is still gravity fed with two-thirds pressurized through the use of pumps. The water treatment process involves natural

Utility Overview (continued)

sedimentation, pre-chlorination, chemical treatment, flocculation, sedimentation, filtration, and post-chemical treatment, a far cry from the early sedimentation process. In 1976 Philadelphia became the first American city to build a pilot plant to determine the best way to remove trace organics as well as tastes and odors from drinking water. The Trace Organics Laboratory was built to monitor the results of the tests. [R#5,6]

Today, the Philadelphia Water Department water system services a total population of 1.74 million people, supplying 349 million gallons per day (MGD) of water in Philadelphia and wholesale water to residents in lower Bucks County through an agreement with Bucks County Water and Sewer Authority. It also supplies City wastewater services to 2.3 million people in a 139 square mile area in Philadelphia and through ten wholesale agreements to a 140 square mile region encompassing parts of Bucks, Montgomery, and Delaware counties surrounding Philadelphia. Fifteen automated pumping stations are integrated with an extensive gravity sewer system comprising 2,900 miles of combined sanitary and storm water sewers. [R#6]

The PWD wastewater system was established in the late 1800s with its first treatment plant going into operation in 1923 with a 60 MGD capacity. As part of an \$80 million stream clean-up program, the plant was updated and enlarged and two new plants were constructed in the mid-1950s. In the early 1970s the City committed \$800 million to achieving water quality goals beyond the established national standards and in the mid-1980s upgraded all three treatment plants which have a combined capacity of 540 MGD. Recognized as solving a major wastewater problem, the plants received state funding and allowed Philadelphia and its suburban neighbors to receive 75% federal assistance for the plants' cost which in turn reduced wastewater utility rates.

The wastewater system not only has three plants which purify residential and industrial waste before they are discharged back into the Delaware River but also encompasses a solid waste management program to convert sludge to compost. The digesters used at two of the plants to process the sludge are taking part in a cogeneration project begun in 1993. Waste heat from engines is used to produce thermal energy to heat the wastewater plants and the methane gas which is a by-product of digesting sludge is used to fuel the cogeneration systems. This standby electrical generating facility allows PWD to purchase power from the Philadelphia Electric Company at low interruptible rates. The utility expects this project to save \$44.7 million over twenty years. [R#1]

At the Biosolids Recycling Center digested sludge and wood chips are turned into a humus-like compost through a process developed by the U.S. Department of Agriculture. It is designed to generate a yield that not only makes an excellent growing medium but is a safe product free of pathogens and viruses. In 1992, 286,610 tons of recycled sludge products were distributed with 46% going to restore park lands, grow flowers, recondition strip mines, produce feed stock, and revitalize dying grasslands. Due to its popularity the composted products are distributed at various community locations where all citizens are welcome to shovel and bag as much of it as they want. [R#1,6]

Financed through an enterprise fund, all capital for the administration and operation of the Philadelphia Water Department is extracted from water and sewer charges collected through the Water Revenue Bureau which acts as the billing and collecting arm of the utility. This arrangement is necessitated by the City Charter which does not allow the Water Department to be a revenue generating department. [R#2,3,6]

Program Design and Delivery

The Conservation Assistance Project (CAP), a direct-installation, water efficiency effort, was introduced in 1986 as a pilot program by the Philadelphia Water Department (PWD) and is its sole demand-side management effort to date. CAP's primary objective is to assist its low-income and payment-troubled customers in reducing their water usage through education and water efficiency measures and repairs. The program enables PWD customers to maintain their water service without interruption due to bill non-payment. It also serves to reduce water bill arrears.

Although no longer with the Water Department, Kimlar Satterthwaite had been the water efficiency Program Director for the Water Department and the guiding light and inspiration behind the water efficiency project. (Satterthwaite was also the Chairman of the American Water Works Association Water Conservation Committee.) Pearline Tollen, who had administered many of CAP's daily functions while Satterthwaite was with the PWD has since accepted the challenge of filling his shoes. The Energy Coordinating Agency of Philadelphia, Inc. (ECA or the Agency) has been under contract with the PWD to administer the program since its inception and reports directly to the Water Department. The Agency subcontracts to Neighborhood Energy Centers (NECs or the Centers) to do the actual delivery and is similarly responsible for the oversight of various other gas and electric utility programs delivered through the NECs.

The Energy Coordinating Agency negotiates contracts, manages, and is the liaison between the Centers and the PWD. It is also responsible for training the NECs' staff on how to deal with customers and handle customer education, as well as data tracking and reporting and quality control of data collection. The Agency invoices PWD for payments due the Centers and then distributes those monies, makes periodic evaluations of NEC performance and regular status reports on the program to the Water Department, and also conducts outreach if the NECs need more participants. [R#2]

Neighborhood Energy Centers are well set up to implement CAP as they are community-based organizations located throughout the City that provide job training, day care, and after-school programs as well as delivering other utilities' programs and administering various government fuel assistance efforts. Autonomous, independent, and education-oriented,

these nonprofits include neighborhood advisory councils, settlement houses, and community-development corporations and are well known in the areas they serve. Working primarily with low-income customers, three to seven NECs are involved with CAP in any given program year. Although they report to the ECA, the Neighborhood Energy Centers are also in close contact with the PWD, working out any issues or questions that arise. [R#2]

MARKETING AND DELIVERY

Marketing of the Conservation Assistance Program is done mainly by the Neighborhood Energy Centers through what is called "intake" where counselors on staff serve people who walk into the Centers. Supplemental materials include flyers distributed door-to-door, newspaper announcements, workshops (at least one water efficiency workshop must be held per year), posters on the walls of the Centers, ethnic volunteers who go into ethnic neighborhoods, and word of mouth. PWD's involvement consists of bill stuffers, funding NEC marketing efforts, and occasionally mailing NEC flyers. The Energy Coordinating Agency is only required to do outreach if the NECs are not getting enough participants. At those times it would conduct annual conservation workshops in the NECs' service areas. To date, the ECA has not had to initiate any workshops. [R#2]

Very little marketing or outreach for the program has been necessary as the Centers experience a large number of walk-in or "intake" customers. An individual may come in looking for one type of assistance and during the course of a meeting with a counselor be made aware of other resources at his or her disposal. Often payment troubled customers in one area have similar problems with their water bills. Sometimes they have heard about CAP by word of mouth and come in specifically to sign up for an audit. The counselor determines eligibility by asking questions and filling out a CAP intake form and examining the customer's utility bill. If the individual qualifies he or she is then referred to a field crew to make an appointment for a free water audit of their home. Very few customers that wish to participate are turned down. [R#2]

To be eligible for the Conservation Assistance Program a customer's water bill must be under \$2,000 in arrears unless recommended by the Water Revenue Bureau as discussed

Program Design and Delivery (continued)

below, the customer's income must not exceed 150% of the poverty level, he or she must own the home, and the home must have a water meter. If it does not have one it must be reported to the PWD. The most common reason for being turned down for CAP is the absence of a water meter. [R#2]

The NEC crew visits the customer's home at the appointed time and initially checks for a water meter. If there is no meter the crew does not perform the audit but instead reports the lack immediately to the PWD. As soon as the PWD installs a meter the customer will be eligible for the program.

If there is a meter (99% have meters) the crew gives the customer two PWD water brochures: "Water Savings" and "Two Dozen Tips." These pamphlets are simply written and easy to understand, and explain water usage and conservation by describing how an individual can save water by simply changing certain habits such as not having the water running while washing dishes or brushing teeth.

The crew then walks through the home with the customer identifying, explaining, and accomplishing whatever measures and minor plumbing repairs are necessary, part of the program, and agreeable. They estimate the water savings to be expected from these measures and show participants how to perform minor repairs and maintenance.

The crews are not usually licensed plumbers but local men with plumbing experience hired and trained by their Neighborhood Energy Center and the ECA. Usually in their 40s and 50s they want a steady job. As a result there has been very little turnover in the implementation crews. (Diversified Community Services has one person who is seventy, very well known in the neighborhood, and who has been with them for years.) The crews are very well received by the participants who quite often already know them. The few complaints heard regarding the program relate to a measure requiring adjustment or that the customer wanted more extensive work done than the program parameters allow. (The NECs do direct the participants who need plumbing work not covered by CAP to programs that offer low- or no- interest loans.)[R#2]

Some Centers handle the delivery of the program a little differently. For instance, one NEC makes separate audit and installation appointments. One crew member does the audits and one the installations. Another NEC handles the customer education in-house but subcontracts out to a plumber for repairs and the measure installations as they are not yet set-up to do the work themselves. A third Center has a hotline where customers can directly refer themselves to the field crew for participation. The perspective participant calls the hotline and then the crew calls him/her back to set up an appointment. [R#2]

An audit and a site report are filled out for each home visit which includes demographic and house layout information and what measures were installed and their prices. The ECA has developed software in the last year which allows this information to be organized into a report. Each NEC now has a computer into which all the data is entered. The resulting report is turned into the ECA. All the information called for in the report must be complete for the NEC to receive payment for the job. The ECA supplies this data to the PWD.[R#2 8.10.11]

A minimum of two efficiency measures must be undertaken for the NEC to be reimbursed while a maximum of \$300 for participants who have been referred through WRAP and \$250 for all other participants, can be spent per residence for repairs, measures installed, and customer education. If an NEC rejects a customer for participation in CAP because they do not have a meter or do not meet one of the eligibility criteria, PWD nevertheless pays the NECs a fee for each customer turned down. This allows the Centers to be compensated for their time and effort. If the applicant is rejected at a pre-screening, the NECs are not reimbursed.

Most CAP participants are owners of old row houses with three bedrooms. Usually there are between two and three occupants with 31% of households having members over age sixty, 17% have two children, 16% have one child, 10% have three, 9% have more than three, and 8% have no children. Most participating households have been black (78%) with

19% white, and 7% Hispanic. The average monthly income for participants is \$560. A participant is usually over \$500 in arrears on their water bill and will require further assistance to catch up and become current on their payments. [R#2]

The Water Revenue Bureau is the organization which collects water fees for the PWD. It has a program to aid payment-troubled customers in getting grants or financial assistance and work out payment plans to cover remaining charges. This effort is called the Water Revenue Assistance Program (WRAP) and is run by coordinator Maudell Dixon. It recommends that customers participate in CAP to further assist them in lowering their bills. The Water Revenue Bureau supplies the ECA with a list of WRAP participants every two to four months. The Agency breaks down the list by zip code and distributes it to the proper Neighborhood Energy Centers where WRAP participants are given first priority for treatment. [R#2,8]

MEASURES INSTALLED

The CAP program installs basic water efficiency measures such as low-flow showerheads and faucet aerators, faucet washers or faucets, toilet retrofit devices (replacement flappers, flush valves, dams, etc.), and repairs toilet, pipe, and faucet leaks. These water-saving measures and repairs have varied little over the years and then usually due to external factors. For example, Philadelphia has a very strong plumbers union which has caused toilet replacements to be prohibitively expensive and therefore dropped as an eligible measure. [R#2]

STAFFING REQUIREMENTS

The Conservation Assistance Project was staffed at the Philadelphia Water Department by Kimlar Satterthwaite (who left in April, 1995). He was the full-time director of the program. His replacement is Ms. Pearline Tollen.

At the Energy Coordinating Agency, Liz Robinson, the Executive Director spends about 5% of her time on contract negotiations with the Neighborhood Energy Centers whose contracts are renewed annually and program oversight. Rudy Tolbert,

Conservation Manager for the ECA who oversees the day-to-day needs of the NECs and PWD, estimates that he spends 10% of his time on the program. Hap Haven, Education Specialist at the ECA, is in charge of training the NECs and focuses his attention on the NECs who have recently become deliverers of CAP. He holds a monthly meeting with all Center directors to discuss any issues or questions that have come up, spending between five and ten percent of his time on the program. Sam Chalfen, a research planner at the ECA upgraded the handling of CAP's data collection, tracking, and reporting by creating database software which he continues to refine. Altogether about one and a half full-time equivalents are spent on CAP at the ECA.[R#2]

Five NECs delivered the program in 1994. They are the Belmont Improvement Association, United Communities, Diversified Community Services, G.R.A.C.E., and Friends Neighborhood Guild. Belmont Improvement Association, for example, has been involved with CAP since 1986 and has four full-time staff dedicated to the program. United Communities has been involved since 1987 and has two full-time employees and two subcontractors deliver CAP. Diversified Community Services has been involved since 1992 and has three staff who administer CAP and related programs and one full-time and one part-time employee deliver it. G.R.A.C.E. which has been involved since the beginning (1986) is no longer delivering the program after 1994. Friends Neighborhood Guild has been involved for just one year and only signs customers up for CAP but does not currently do any audits or installations. They do however subcontract the work to a plumber on a part-time basis. Altogether the NECs have approximately 11 full-time equivalents working on CAP.[R#2]

Monitoring and Evaluation

In the early years of the CAP program very little emphasis was placed on monitoring by PWD and ECA. Recently, however, and following the process evaluation discussed below, CAP's monitoring efforts have increased and provide program decision makers and stakeholders with greater confidence in the program's delivery mechanisms and effects. [R#8]

To insure an objective analysis, the Philadelphia Water Department hired a firm from outside Pennsylvania to evaluate the Conservation Assistance Program. Wisconsin Energy Conservation Corporation (WECC) was chosen and performed impact and process evaluations on CAP which were completed in September of 1994. The impact evaluation analyzed demographics, savings, costs, payments, cost-effectiveness, and long-term economic impacts from 1992 and 1993. It is presented qualitatively below and then discussed in detail in the Savings section of this Profile. The process evaluation focused on the 1993 program year and included interviews with staff from the City of Philadelphia (both the Water Department and Water Revenue Bureau), the Energy Coordinating Agency, and the Neighborhood Energy Centers. In addition three 1993 program participant focus groups were conducted. [R#2]

MONITORING

With three organizations involved in the administration and delivery of CAP, monitoring of installations and quality checks essentially "fell through the cracks" until recently. The NECs' internal quality control checks have been adequate, based on phone calls to customers to make sure they were satisfied with the field crew that came to their home and the water efficiency measures that were installed. In addition to these ad hoc phone surveys, PWD has also made select phone checks and occasional site visits when staff is available but has had no systematic way of going about this or keeping records of when the calls or visits occurred. To date less than 100 telephone surveys and site visits have been made by PWD. Recently ECA began monitoring program activities on a regular basis through new computer-generated reports and is now inspecting an average of 10% of each contractor's work. These steps will help to better track the program and its success. [R#2,8,10,11]

Since the Philadelphia Water Department has plenty of drinking water and water treatment capacity and is not seeking water system savings, there has been no end-use metering component of the CAP program. Bill analysis has been used mainly to see if the program has indeed helped payment-troubled customers catch up. WECC used this and engineering estimates based on water saved by measures installed in their calculations for the impact evaluation. [R#2]

EVALUATION

THE IMPACT EVALUATION

WECC determined water savings by taking the meter readings of program participants prior to treatment, during the treatment (the period between meter readings during which the retrofit occurred), and after the treatment. From these an average daily water usage was determined for each household during each treatment period. The savings were derived from subtracting the post-treatment average daily usage per participant from the pre-treatment average daily usage. [R#2]

WECC used a control group of customers who were retrofitted in 1993, one year later, to help compensate for a myriad of external factors such as the development of new plumbing leaks, seasonal usage patterns, and meter change-outs as older meters typically under-report usage. [R#2]

To calculate the impact of CAP on payment behavior, WECC compared bills and payments for program participants for three pre-installation years and a post-installation year. A control group that was not retrofitted until late 1993 was used and the same calculations were made for the same time periods. To determine the net change in payments WECC took the post-treatment payments and subtracted the pre-treatment payments. Then they subtracted the same pre-treatment time period of the control group from the post-treatment time period of the control group. The total of the control group was then subtracted from the total from the treatment group. This equalled the net change in payments.

The reason for the control group was to account for all non-program related factors that affect payment behavior. These included participating in WRAP, the billing system switching from quarterly to monthly, two rate increases, and a change out of water meters to more accurate ones. The City has an ongoing program to replace outdated water meters and to install new ones on buildings and homes that don't have them. The consequence of this program has been higher water bills due to the more accurate new meters. [R#2]

The results of the analysis showed that relative to the comparison group, CAP participants had lower bills, paid a greater proportion of their outstanding balance, reduced their delinquency in bill payments, and paid their current bills in full more often than the group that did not have the retrofits. $\lceil R\#2 \rceil$

THE PROCESS EVALUATION

WECC's process evaluation had three objectives. First to look at the implementation and administration of CAP and assess its strengths and weaknesses; second to examine specifically the use of Neighborhood Energy Centers to deliver the program. The third goal was to draw conclusions and make program recommendations on the overall effectiveness of CAP.

The first objective involved interviews with staff and participants of CAP. Meetings with City of Philadelphia Water Program staff included Kimlar Satterthwaite, then CAP's Program Director with full autonomy for administering the program. Satterthwaite oversaw both the Energy Coordinating Agency and the Neighborhood Energy Centers. Overall he felt that the program was running well and that the PWD had had a good working relationship with the Energy Coordinating Agency. He also felt that the PWD had excellent relationships with the NECs' delivering CAP. Mr. Satterthwaite believed that most of the savings accrued from CAP had been the result of leak repair with the other conservation measures and educational component accounting for only modest savings. [R#2]

The other City staff person interviewed was Maudell Dixon, the Program Coordinator of the Water Revenue Assistance Program (WRAP) of the City's Water Revenue Bureau (WRB). She heads a staff which provides financial counselling, assistance, and program options to people in water bill arrears. WRAP refers customers to CAP. Ms. Dixon felt very strongly that WRAP and CAP ought to be offered together instead of through two different agencies with no common database and recommended that WRAP customers be required to participate in CAP to qualify for WRB assistance. [R#2]

Interviews with the Energy Coordinating Agency staff indicated good relationships with both PWD and the NECs. ECA staff did, however, suggest that it could do a better job of tracking the program and that the database software that it was developing would allow it to far better facilitate program tracking through improved data collection by the NECs. This, in turn, will allow ECA to supply the Water Department with the information it needs to refine the program. Since the 1994 evaluation this situation has been corrected and tracking the program, from results to payments, has been significantly enhanced. [R#2,8]

The Neighborhood Energy Centers maintain that they are the ideal vehicles for the delivery of CAP. They are already firmly rooted in low-income neighborhoods and involved in the delivery of other utility programs. WECC found that the NECs

feel they have a good relationship with the Water Department. WECC found, however, that some NECs felt that they had some issues to resolve with ECA, including payment on a timely basis. ECA strongly objected to this evaluation finding, citing insufficient research and analysis by WECC, even conducting its own survey of the NECs to assure proper functioning of the program. The one NEC representative cited by WECC's evaluation with the strongest objections to ECA's role reportedly had a "vendetta" against ECA since his agency had recently been undesignated as an NEC. Others, according to ECA, were using ECA as a scapegoat for any program shortfalls. While ECA claims that the "problems" in the delivery mechanism were over-amplified, they have now been largely eradicated. For instance, the new software program developed by ECA has allowed payments to the NECs to be even more timely. Furthermore, ECA's role in program support such as trainings and feedback has been more clearly defined and pursued. [R#2,8,9]

Matousek and Associates assisted WECC by conducting three focus groups held at Belmont Improvement Association, United Communities, and Diversified Community Services NECs over a two-day period in February of 1994. CAP participants from 1993 were offered \$35 to attend a ninety-minute meeting and answer questions regarding the program. Their responses were both audio and video taped. Interviews with the thirty-three past participants revealed that most were very happy with CAP, the field crew that did their audit and retrofits, and felt they gained a lot of useful information on water conservation. They felt the brochures were very informative and when being asked about things they learned were able to respond cogently and accurately. When asked if they noticed a reduction on their water bills, many answered "no." When asked whether they were saving water, most thought they were. They attributed the lack of money savings to a substantial rate hike and the change-out of old meters for new more accurate ones and felt the program prevented their bills from getting any higher. The billing system itself was changed from a quarterly billing cycle to a monthly one with every other month estimated. This might also have contributed to the focus group members not noticing any dollar savings. [R#2]

To meet the goal of assessing the NECs' delivery of CAP, the evaluators accompanied several different NEC field crews on audits and installations. The evaluators found that the crews performed very well, more than adequately fulfilling their commissions. WECC reported that perhaps their biggest advantage was how well they communicated with program participants. The Water Department was interested in learning whether or not it would be more effective to have professional plumbers deliver CAP. The evaluation showed that the NECs and their local staffs were one of the main strengths of the program, performing repairs and measure installations and customer education quickly, professionally, and efficiently. [R#2]

Program Savings

Overall CAP saved 5,144 thoudand cubic feet (MCF) of water in 1992 and 5,498 MCF in 1993. Lifecycle water savings will be 51,437 MCF for measures installed in 1992 and 54,981 MCF for 1993 program participants. The program has resulted in average annual water savings assessed for 1992 of almost 4,000 cubic feet (CF) per participant, an average 25% water savings, according to WECC's impact evaluation of the program. Fully 90% of the total water savings realized through this program were achieved by 10% of its participants, namely residences with a noticeably high level of consumption. This often resulted from a major leak and was not a function of a participant's water use habits. While these large water users experienced an average 37.2% reduction in water consumption, more typical residences saved on the order of 8.5%. [R#2]

CUSTOMER BILL SAVINGS

WECC calculated program savings in terms of reduced bill arrears as the Water Department is primarily interested in the payment behavior of the participants. It was determined that, on average, the participants were \$33 less in arrears than before the program. $\lceil R\#2 \rceil$

The program provides the Water Department a net savings of about \$97 in net present value benefits per treated household over a ten-year period, through reduced future arrears. Overall the PWD receives about \$1.48 in benefits for each dollar invested in CAP. Free ridership is not a considered factor in the program. [R#2]

PARTICIPATION TABLE	PARTICIPANTS	ANNUAL WATER SAVINGS PER PARTICIPANT (CF)
1992	1,292	3,981
1993	1,381	3,981
Total	2,673	3,981

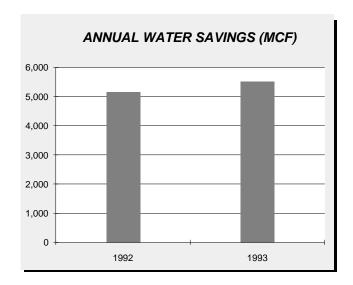
PARTICIPATION RATES

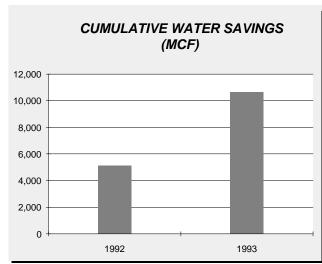
Philadelphia Water Department budgeted for the retrofit of 2,000 low-income and payment-troubled households in 1993 and its contractors accomplished 1,381 treatments. In 1992, 1,292 retrofits were done. There is some disagreement over these figures which come from the WECC report as the entire budget allotted for the program was used and the record keeping by all agencies involved was sketchy. Also ECA reallocates funds towards the end of each year based on the performance of the NECs. If one is behind some of their funds will given to a center that is ahead of schedule. This further complicates the record keeping. [R#2]

MEASURE LIFETIME

WECC assigned an overall average lifetime of ten years for measures installed which The Results Center has used in order to calculate lifecycle water savings and the cost of saved water in the next section.

SAVINGS OVERVIEW	ANNUAL WATER SAVINGS (MCF)	CUMULATIVE WATER SAVINGS (MCF)	LIFECYCLE WATER SAVINGS (MCF)
1992	5,144	5,144	51,437
1993	5,498	10,642	54,981
Total	10,642	15,786	106,418

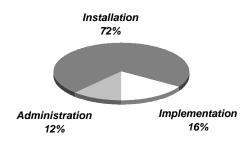




Cost of the Program

COSTS OVERVIEW	ADMINISTRATION (x1,000)	INSTALLATION (x1,000)	IMPLEMENTATION (x1,000)	TOTAL PROGRAM COST (x1,000)	COST PER TEATED HOUSE
1992	\$30.85	\$177.32	\$38.87	\$247.03	\$191.20
1993	\$29.92	\$180.24	\$40.50	\$250.67	\$181.51
Total	\$60.77	\$357.56	\$79.38	\$497.70	\$186.20

PROGRAM COST COMPONENTS



The cost of the Conservation Assistance Program varied little between the 1992 and 1993 program years. The administrative costs remained constant in nominal dollars at \$33,200 per year. (This expense is mainly attributed to the ECA which reported a CAP budget of \$33,600 per year.) The installation costs rose \$2,920 from \$177,320 in 1992 to \$180,240 in 1993 and the implementation costs rose \$1,630 from \$38,870 in 1992 to \$40,500 in 1993 (this went mainly to the NECs). Overall total program costs increased by \$3,640 from \$247,030 in 1992 to \$250,670 in 1993. [R#2]

COST PER PARTICIPANT

In 1992-1993, PWD had a \$250 spending limit set per house treated. Since the Conservation Assistance Program is a direct installation effort there are no customer costs, all measures and repairs are done free of charge. The average cost per retrofit for 1992 was \$191 per household and slightly less in 1993 at \$182. The overall administrative costs remained constant at \$33,200 per year, although the administrative cost per retrofit decreased from \$24 in 1992 to \$22 in 1993. The installation and implementation costs per treatment in 1992 were \$167 and decreased to \$160 in 1993 per house.[R#2]

COST EFFECTIVENESS

The unlevelized total program expenditure for 1992 was \$265,893. WECC calculated that first-year benefits for the 1,292 treated homes totaled \$49,871. The present value of first-year savings over ten years is \$385,092 assuming a 5% discount rate. The net present value is the difference of these, or \$119,199 (\$92 per treated home). Thus the program's benefit/cost ratio for work completed in 1992 was calculated to be 1.45. [R#2]

The Water Department realizes long-term benefits from the program but these are highly dependent on high usage participants. The WECC evaluation found no relationship between the money spent per house and the payment impacts. [R#2]

MEASURES OVERVIEW 1993	HOUSES TREATED	INSTALLATION FREQUENCY	COUNT OF MEASURES	MEASURES PER TREATED HOUSE	TOTAL COST	AVERAGE COST PER MEASURE	AVERAGE COST PER HOUSE
Showerhead	1,567	0.59	1,641	1.05	\$18,295	\$11.15	\$11.68
Toilet Dam	821	0.31	1,087	1.32	\$3,406	\$3.13	\$4.15
Flapper Valve	1,113	0.42	1,221	1.10	\$6,972	\$5.71	\$6.26
Aerator	2,202	0.82	3,703	1.68	\$10,156	\$2.74	\$4.61
Washer Repl	929	0.35	3,110	3.35	\$13,850	\$4.45	\$14.91
Faucet Repair	1,241	0.47	3,386	2.73	\$34,555	\$10.21	\$27.84
Single Faucet Repl	123	0.50	169	1.37	\$3,401	\$20.12	\$27.65
Double Faucet Repl	1,614	0.61	2,126	1.32	\$82,324	\$38.72	\$51.01
Flow Master	1,281	0.48	1,432	1.12	\$14,437	\$10.08	\$11.27
Ball Cock Repl	41	0.20	42	1.02	\$379	\$9.02	\$9.24
Float Repl	31	0.20	31	1.00	\$92	\$2.96	\$2.96
Pipe Leak Repair	617	0.23	617	1.00	\$8,307	\$13.46	\$13.46
Reset Toilet	99	0.40	101	1.02	\$2,104	\$20.83	\$21.25
Replace Stopper	1	0.00	1	1.00	\$29	\$28.80	\$28.80
Toilet Guide Rod	160	0.60	167	1.04	\$774	\$4.64	\$4.84
Other Repairs	57	0.30	57	1.00	\$619	\$10.86	\$10.86
Education	2,651	0.99	2,651	1.00	\$11,469	\$4.33	\$4.33
Total	14,548	5.45	21,542	1.48	\$211,16	\$9.80	\$14.52

Lessons Learned / Transferability

LESSONS LEARNED

Fundamentally the Conservation Assistance Program is a success. It fulfills its objectives of helping to lower low-income and payment-troubled customers' water consumption, and thus to ease bill arrears. It also saves water on a cost-effective basis. Due to a substantial rate hike in the last two years, the program has become even more important in helping low-income customers maintain their water service.

Key to the program's success is its use of neighborhood energy centers which provide a range of social services to deliver the program: NECs have very direct access to potential participants so little marketing is needed. The field crews are providing comprehensive audits, performing high quality installations and repairs, and doing an excellent job of educating customers on water use and efficiency. The Centers also adequately follow through with participants to make sure they are satisfied with the retrofit and the field crews and if not, correcting the situation. Furthermore hiring the field crews locally provides for an economic benefit in the neighborhoods.

The WECC evaluation of the program found that the requirements and responsibilities of each organization involved in the administration and delivery of the program needed to be more clearly defined: WECC's process evaluation of the program concluded that the program could be improved by better defining the role of the administrator, the Energy Coordinating Agency. WECC claimed that ECA oversees the NECs but does not have a specific duty to train the NECs in the delivery of the program or to make sure the intake and audit forms are filled out correctly or to report the data collected to the PWD. Although the Agency is charged with overseeing the customer education component of training the NECs it is not specifically mandated with the duty of performing the training themselves. Accordingly, the bulk of this task has fallen on the shoulders of the NECs. Also there were no manuals to specify how the field crews are to be trained.

Since the WECC evaluation the above recommendations have been implemented. The Energy Coordinating Agency's role has been more specifically defined. The Agency now provides additional trainings to the NECs in the management of the program and conducts quality control inspections on 10% of the NECs' field work. A program manual has been developed and training in the use of the manual has been provided to all NECs currently working in the program. The manual will be

modified as necessary. An education manual and additional materials have also been developed for the participants to improve the quality of their education and to increase its consistency from one customer to the next. In addition, the ECA has begun follow-up education for the participants through its newsletter, "Neighborhood Energy News" which goes to low-income participants in energy conservation programs and has invited these clients to join the "Neighborhood Energy Club" to receive further training.

The WECC report also suggested the monitoring of the program could be strengthened to the program's advantage: In order to gather important demographic information for the PWD to analyze and to provide feedback to the NECs for fine-tuning the program, WECC recommended that a database needed to be set up and tracking and reporting protocols set in place. The data collection by the NECs requires additional attention not only in terms of the field crews being more diligent in filling out its audit and site reports and invoices, but also in the criteria for information collected so that the reports can be useful to the PWD. For example, pre- and post- retrofit flow rates could be taken to figure out how much water is actually being saved by which measures. Also more demographic information may be useful in determining water-use patterns, such as the number of bathrooms in each home. Information on why a measure was not installed or on repairs needed but not covered by CAP may help clarify specific program results. The ECA also needs to oversee the NECs more closely and report the data collected to the PWD on a regular and timely basis. Also many households participate in the program more than once, although this is prohibited. There was no database to cross-check customers served by

Since the evaluation, the intake, audit, and site forms include more demographic information, bill payment histories for all utilities, and more information on the condition of the house. They are entered into a computer database by the NECs. The software developed by the ECA called Management Information System (MIS) organizes this information into reports. All the data required by these reports must be included for the NECs to be paid for the work and payment is now more timely. (ECA is proud of its quick bill payment.) Together the PWD, ECA, and the NECs are currently working out the flaws in the new system. [R#8,9]

audits waste

program

the program and duplicate

resources.[R#2]

The information from these reports is provided monthly to the PWD on disks so that the PWD may fine-tune the program. NEC-specific reports are also generated for the Centers (with copies sent to the PWD) so they may improve their own quality control procedures. The MIS software also has safeguards to prevent a house which has been treated in the last three years from being entered, cutting back on duplicate house audits and retrofits. [R#9]

Bulk purchases of materials have been ineffective: The WECC report suggested that if the PWD bought the materials in bulk and distributed them to the NECs, the measures installed would be more uniform in quality and much more cost-effective. The NEC crews at the time of the evaluation purchased their own supplies and invoiced the PWD. WECC felt this was expensive and meant that the lowest price was usually the determining factor on which products were bought and not quality. [R#2]

Bulk purchasing by the PWD was implemented and continues but has certain drawbacks. It was found that due to the age of a lot of the homes being treated and therefore the age of the plumbing, non-standard measures were necessary and therefore bulk purchasing was not feasible in a lot of cases. Also the NECs are not happy with the quality of the items bulk purchased and according to Evelyn James at Belmont Improvement Association, her crews are able to purchase many items more cheaply than the PWD.

NECs strongly suggest that the per home price cap be carefully reassessed in light of program experiences:

There is currently a price cap of \$250 per home treated. The ECA and the NECs would like to see this cap raised due to increases in the cost of supplies and in light of appropriate exceptions that could be made at the discretion of the field crews. They feel it defeats the purpose of CAP if a field crew goes to a house with a very high water usage and discovers that there is a major leak which will cost more than \$250 to fix. (For \$300, for example, large savings could be made.) Without fixing the leak the efficiency measures and customer education will have very little effect on the water usage, as it is primarily a result of the leak. Since 90% of the savings come from 10% of the participants which are the largest water users, it would be in everyone's best interest to fix major leaks. [R#2,7]

Since field crews do not gauge water flow rates of existing appliances, some retrofits may be conducted that are unnecessary: It is possible that in some cases low-flow showerheads may be replacing already low-flow showerheads. Also, without measurements it is impossible to accurately determine the water-savings per measure per abode. [R#2]

A lack of coordination between marketing efforts has caused unnecessary hardships: In several instances the PWD has inserted bill stuffers for its customers promoting the program but has not warned or communicated this to the NECs. As such, the NECs have been overwhelmed by the response causing waiting lists for customers wishing to participate in CAP. If they were informed of the bill stuffers beforehand, NECs' staff suggest that they could more adequately prepare and therefore be better able to handle a heavy influx of clients. [R#2]

The most important aspect of the program is education:

Pearline Tollen (Director of CAP), Liz Robinson (Executive Director of the ECA), Evelyn James (Director of the Belmont Improvement Association), and Diane Grimes (Director of Diversified Community Services) all agree that the most important aspect of the Conservation Assistance Program is its educational component: making people aware of their water usage habits and teaching them how to change them, instructing them on how to make minor repairs and maintain their plumbing to help prevent future problems. All these elements help not only to lower water bills but also have social value. The customers are more aware of their habits and have more control over their environment, allowing them to make more informed decisions and take positive action. If they have a small plumbing problem they are more likely to know the consequences of it and may be able to fix it themselves.

Coupling CAP with other utility programs has been a key to NECs' success in delivering comprehensive services to their constituents: NECs have been clever in how they have combined the delivery of the various programs that they implement. This occurs to some degree by the very nature of the Neighborhood Energy Centers and the forms that are filled out by every individual coming into the centers and which encompass questions on all utility bills and services. Liz Robinson, Maudell Dixon, Evelyn James, and Diane Grimes believe that combining the implementation of the utility programs is great idea. Not only does it save time and money but the customer is more likely to agree to one appointment than several

Belmont Improvement Association, for instance, already combines the utility programs and quite often will deliver gas and electric programs at the same time as the water. The same field crews deliver all the programs. If they are at a residence to carry out the water program and recognize a need and qualification for the electric utility weatherization program they are equipped to implement that one on the spot as well.

Lessons Learned / Transferability (continued)

TRANSFERABILITY

The Conservation Assistance Program appears to be highly transferrable to other cities as it is a relatively simple program with three key elements: using community-based organizations to implement the direct-installation program; performing leak repair; and having a strong educational component which allows customers to take charge of their water consumption.

CAP also successfully embraces a number of issues facing most cities today, giving it broad application. As a social program it addresses low-income customers and provides water usage and conservation education. As an economic program it aids low-income and payment-troubled customers by helping to lower their water bills and easing bill arrearages. Essentially, the program supports low-income communities, not just individuals going through the NECs. Finally, as a conservation program as it saves water and downstream water treatment capacity.

Other water programs such as New York City's audit program cover some of the CAP parameters but not all. Started in 1991 to serve apartment buildings as well as one- to three-family homes, the program offers free leak audits on a unit-by-unit basis complete with energy and water savings calculations. The auditors also install low-flow showerheads, flow-restricting faucet aerators, and toilet tank displacements bags. It is then the customer's responsibility to have the leaks repaired. This program does not specifically target low-income and payment-troubled customers, or have a strong educational component, and is not designed to ease bill payment problems but to save water as New York City faces both water and wastewater treatment capacity problems. [R#7]

CAP's program concepts are also transferrable to the electric and gas utilities as bill arrearages occur across utility types. It is an excellent example of a low-income program which is actually cost effective, an important consideration that has not traditionally been a factor in the electric utility industry. Most low-income, direct installation electric programs were mandated by regulators and cost-effectiveness was not a consideration. Programs such as Southern California Edison's Low Income Relamping (Profile #2) did use community-based organizations to directly install compact fluorescent lamps in low-income housing. However, the focus was on saving electricity and did not have a particular emphasis on education or bill arrearage nor did it seek to recover its expenditures.

United Illuminating implemented a program called Homeworks (Profile #15) which also used community organizations and installed many different types of efficiency measures with an emphasis on education. The City of Austin's Gas Technologies Program (Profile #94) has a direct-installation segment which provides weatherization and space heaters for its low-income customers. The emphasis of this effort is on environmental concerns and the promotion of natural gas use. For other examples of low-income, direct-installation programs please also see The Results Center Profiles #22, 61.75.91.895.

References

- 1. Philadelphia Water Department Executive Summary, 1992.
- Wisconsin Energy Conservation Corporation, "Process and Impact Evaluation of the City of Philadelphia Water Department's Conservation Assistance Program," September 14, 1994.
- Paul Berkowitz, Director, Demand-Side Program Analysis, Wisconsin Energy Conservation Corporation, personal communication, February July 1995.
- Kimlar Satterthwaite, Program Director Conservation Assistance Program, City of Philadelphia Water Department, personal communication, January February 1995.
- 5. Philadelphia Water Department, "How Water in Philadelphia is Treated and Distributed," 1992.
- Philadelphia Water Department, promotional brochure, undated.

- 7. Abba Anderson, Home Energy magazine, "The Big Flush: Saving Water in the Big Apple," July/August 1994.
- Elizabeth Robinson, Executive Director, Energy Coordinating Agency, Inc., personal communication, June July 1995.
- 9. Pearline Tollen, Program Director Conservation Assistance Program, City of Philadelphia Water Department, personal communication, June July 1995.
- 10. Evelyn James, Belmont Improvement Association, personal communication, July 1995.
- 11. Diane Grimes, Diversified Community Services, personal communication, July 1995.
- 12. Sabrina L. Karl, Wisconsin Energy Conservation Corporation, personal communication, March 1995.
- 13. Greg Dalhoff, Wisconsin Energy Conservation Corporation, personal communication, March 1995.

Special thanks to Kimlar Satterthwaite, Paul Berkowitz, and Pearline Tollen for their guidance and support throughout the development of this profile.